SIKKIM UNIVERSITY

(*A Central University established by an Act of Parliament of India, 2007)*
6th Mile, Samdur, PO Tadong, Gangtok- 737102

Academic Session 2010-11
Entrance test (SET:D- INTERNATIONAL RELATION)

MPhil/PhD Integrated Programme

Time: Three hours Maximum Marks: 75

Instructions for the candidates

1. **Duration of the Entrance Test is three hours.**
2. **No candidate shall be allowed to enter the examination hall half an hour after the commencement of the examination.**
3. **Candidates can only be allowed to leave the examination hall one hour after the commencement of the examination.**
4. **No candidate shall be allowed to continue writing the examination after the final bell.**
5. **If any answer is to be crossed out, cancel it by drawing a line across it.**
6. **Please read the questions carefully before answering.**
7. **Each question shall carry 15 marks. Wherever required the marks distribution is indicated alongside the questions.**
8. **Candidates have to answer only 5 questions. One question from each section is compulsory.**
9. **Please ($\surd$) mark the question you have attempted in the cover page of the answer booklet.**
10. **Candidates can choose any discipline/subject and can attempt any question subject to the condition mentioned at sl. No. 8 above.**
11. **After finishing the work, handover the answer book only to the Invigilator.**

One question from each section is compulsory

SECTION 1: GENERAL

1. Write an essay on the concept "Human Security" and its relevance in the recent global debates on development

2. Explain the rationale of planning in the context of economic development with specific reference to India.

3. What is Research Methodology? What are the various techniques of Research Methodology?

4. Discuss the role of languages in regional consciousness and national integration in India

5. Do you agree with the view that green revolution led to regional disparity in agricultural development in India? Give reasons in support of your view.

SECTION 2: CORE-INTERNATIONAL RELATION

6. Explain the concept 'Power' and its importance in the study of International Relations

7. What is Humanitarian Intervention? Explain the impact of humanitarian intervention on state sovereignty

8. Summarise the Neo-Realist versus Neo-Liberal debate (on Security and Economy) in International Relations Theory

9. Analyse the impacts of terrorist activities on the security of South Asian countries

10. Critically analyse the changing role of United Nations in current world politics

SECTION 3: ELECTIVE

BOTANY

11. Describe the symptoms and causal organisms of stem rot of jute.

12. What is PCR? Describe the principles and function of DNA analyser.

13. What are the roles of pollen in plant taxonomy? Mention pollen allergy.

14. What is the difference between climate change and global warming? Explain the ozone depletion factors.

15. Differentiate between biodiversity and bioresources? Classify the bioresources of the Himalayas.

CHEMISTRY

16. (a) What do you mean by K_p and K_c ? Establish the relationship between them.
    (b) Deduce van't Hoff's equation. What is its importance ?
    (c) State and explain Le Chatelier's principle.
    (d) Give an expression of K_p for the following reaction:
    $\frac{1}{2}N_2 + \frac{3}{2}H_2 = NH_3$
    (e) Give an expression for Maxwell's distribution of molecular velocities.[5+6+3+4+2]

17. (a) Discuss the spectroscopic characteristics of the following molecules (i.e. UV, IR, NMR):
    (i) Acetyl acetone
    (ii) acetophenone
    (iii) Ethanol
    (iv) Toluene
    (v) Benzyl alcohol

    (b) What is peptide bond ? Explain a helix structure of protein.
    (c) Write a brief account on photo electric effect. [2 x 5 + 3 + 3 + 4]

18. Discuss the following reactions on the basis of mechanism and applications:
    (a)Gatterman-Koch reaction
    (b) Sharpless asymmetric epoxidation
    (c) Baeyer-Villiger oxidation
    (d) Meerwin-Pondorf-Verley reduction
    (e) Mannich reaction. [4 x 5]

19. (a) What is a radical distribution function ? Draw this function for 1s, 3p and 4p orbitals.
    (b) What are radio ratio rules ? Show that the limiting radius ratio for a tetrahedral structure is $0.05 - 0.225$.
    (c) Write down the Born-Lande equation clearly explaining the terms involved. [8+8+4]

20. (a) How are aldehydes and ketones differentiated during qualitative analysis? Write the relevant tests and equations for the chemical reaction involved.

    (b) What is the role of pH in redox titrations ? Illustrate your answer with one example.

    (c) What precautions should you take while liberating iodine during an iodometric analysis and why? [7+7+6]

ECONOMICS

21. 'Good rural infrastructure promotes agriculture and hence economic growth'- Attempt a critical assessment of this statement.

22. What major changes in agrarian structure would you like to suggest to make Indian agriculture globally competitive?

23. Briefly outline the main features of demand side approaches and supply side approaches to understanding the macroeconomic. Contrast the two, and what would be the policy implications of the two?

24. Contrast the 1980s growth experience in India with the post-1991 growth experience in India.

25. Examine the salient features of WTO agreement in relation to agriculture

EDUCATION

26. Discuss the different methods of acquiring valid knowledge. Explain scientific enquiry as an approach of acquiring the same

27. Explain how school, family and community can work together to bring educational development?

28. Mention and explain the major features of curriculum design, development and transaction?

29. Discuss the nature of educational technology along with its nature, scope and significance

30. What are the three major forms of social mobility and how does education influence them?

ENGLISH

31. Write an essay on the influence of science in literature

32. Write an essay on the "Poetic Drama" of the twentieth century

33. Write a short essay on the metaphysical poets of the seventeenth century

34. Trace the origin and development of English essay

35. "Wordsworth is a poet of nature". Do you agree with this statement? Substantiate your arguments

GEOGRAPHY

36. Discuss the Central Place Theory and its significance in understanding the settlement system.

37. What are the factors of industrial location? Illustrate your answer citing suitable examples from India.

38. Discuss the regional distribution of drought-prone areas of India and the economic significance of these areas.

39. Discuss the Concept of Human Development as defined by the United Nations Development Programme and its significance in the contemporary debates on development

40. Write short notes on any three of the following:
    (a) Positivism in geography
    (b) Cultural landscape
    (c) Rim-land theory
    (d) Isostacy
    (e) Core-periphery theory

HISTORY

41. Elucidate main feature of cultural attainment under the Guptas. Did the period witness a renaissance?

42. What were the main reasons for the decline of the Mughal Empire?

43. What do you understand about the Rebellion of 1857? Why did it fail?

44. What is the meaning of colonisation of Indian economy? What happened to Indian economy under colonialism?

45. Elucidate main feature of cultural attainment under the Guptas. Did the period witness a renaissance?

MATHEMATICS

46. State and prove Green's Theorem in the plane. Hence verify the theorem for

$$\oint_{\tau} \quad (x^2dx + xydy) \quad ,$$

where τ is a square in the xy plane given by $x = 0$, $x = a$, $y = a(a > 0)$ described in the positive sense. [2+10+8]

47. (a) Define giving examples

i. monotonically increasing functions

ii. even functions.

iii. implicit functions.

iv. bijective functions.

(b) Show that $y = |x|$ is continuous at $x = 0$ but not differentiable at that point. Is differentiability of a function is sufficient condition for continuity at that point? Justify your answer. [10+10]

48. (a) Using Graphical method solve the following L.P.P

$$\text{Maximise} z = 2x_1 + 3x_2$$

$$\text{subject to} x_1 - x_2 \leq 2 \quad , \quad x_1 + 2x_2 \geq 4 \quad , \quad x_1, x_2 \geq 0$$

(b) Obtain an initial basic feasible solution of the following T. P.

	A	B	C	
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
	6	10	15	

by Vogel's approximation method. [10+10]

49. (a) State and prove Rolle's theorem

(b) A function $f(x)$ is defined in the following way,

$$\begin{aligned} f(x) &= -x, \quad \text{when} \quad x \leq 0 \quad , \\ &= x \quad \text{when} \quad 0 < x < 1 \quad , \qquad (0.1) \\ &= 2 - x \quad \text{when} \quad x \geq 1 \quad . \qquad (0.2) \end{aligned}$$

Discuss the continuity of the function at $x = 0$ and at $x = 1$. [10+10]

50. (a) Show that differentiability of a function implies its continuity. Is the converse true? Justify your answer. [5+5]

(b) Define the following giving examples:

i. Explicit functions
ii. Odd functions
iii. Onto Functions.
iv. Monotonically decreasing functions. [10+10]

MICROBIOLOGY

51. Describe the structure and replication of T4 bacteriophage?

52. Explain how Granulocytic cells are classified and the functions of various types of Granulocytic cells. Discuss the structure and role of Dendritic cells and Follicular Dendritic cells.

53. What are bacteriocins? Give two examples of bacteriocins with their producing organisms. Explain the antimicrobial mode of action of any one bacteriocin. (2+4+9)

54. What do you understand by transformation of animal cell by virus? What are proto-oncogenes and write six characteristics of cellular proto-oncogenes? Describe how viral infection (at least one DNA and One RNA virus) can lead to oncogenesis?

55. Write a brief note on:
a) Antigen Dependent Cell mediated Cytotoxicity
b) Apoptosis
c) Phagocyctosis
d) Transcytosis
e) P-region nucleotide addition (P-addition)

PEACE AND CONFLICT

56. India which was home to the Buddha, Emperor Ashoka and Mahatma Gandhi is the land of Peace. Do you agree with the statement?

57. Discuss religion as a cause of conflict.

58. Do you agree that third world countries are insecure more from within than outside threats? Discuss this point

59. Do you think reservation of opportunities for the deprived sections of the population would help to reduce structural violence? Elaborate your answer with reference to the debate on reservation of seats for women in the parliament and legislative bodies in India.

60. What is the role of United Nations in Conflict Resolution?

PHYSICS

61. (a) The mutual potential energy V of two particles depends on their mutual distance, r as follows:

$$V = \frac{a}{r^3} - \frac{b}{r}, a > 0, b > 0$$

For what separation, r, are the particles in static equilibrium ?

(b) Find the kinetic energy of rotation of a rigid body with respect to the principal axis in terms of Euler's angle.

(c) Interpret the results when the moment of inertias $I_1 = I_2$

(d) If T is the kinetic energy, G is the external torque acting on the rigid body about the instantaneous axis of rotation and $\overrightarrow{\omega}$ is the angular velocity, then prove that [5+5+2+3]

$$\frac{dT}{dt} = G \cdot \overrightarrow{\omega}$$

62. (a) Prove that the general relation giving the uncertainties product of two operators, $\hat{\mathrm{A}}$ and $\hat{\mathrm{B}}$ is given by

$$\triangle\hat{\mathrm{A}}\triangle\hat{\mathrm{B}} = \frac{1}{2}|\langle[\hat{\mathrm{A}}, \hat{\mathrm{B}}]\rangle|$$

(b) Using the above relation, find uncertainty relations between the components of the position and the momentum operators.

(c) Consider a particle of mass m moving in a potential V(r, t), so that its Hamiltonian is given by

$$\hat{\mathrm{H}} = \frac{\hat{\mathrm{p}}^2}{2\mathrm{m}} + \hat{\mathrm{V}}(\mathrm{r}, \mathrm{t})$$

Using Heisenberg equation of motion and commutator algebra, prove that [5]

$$\frac{\mathrm{d}}{\mathrm{dt}}\langle\hat{\mathrm{r}}\rangle = \frac{\langle\hat{\mathrm{p}}\rangle}{\mathrm{m}}$$

$$\frac{\mathrm{d}}{\mathrm{dt}}\langle\hat{\mathrm{p}}\rangle = -\langle\nabla\mathrm{V}\rangle[5+5+5]$$

63. (a) Represent the following periodic function as a Fourier series.

$$f(x) = 0 \quad \text{for} \quad -\pi < x \leq 0,$$
$$= x \quad \text{for} \quad 0 \leq x \leq \pi.$$

(b) Using the above Fourier series prove that,

$$\frac{3\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + ...$$

(c) One dimensional neutron diffusion equation with a plane source is given by

$$-D\frac{d^2\phi}{dr^2} + k^2 D\phi(x) = Q\delta(x).$$

Apply Fourier transform on this equation and solve it in the transverse space. [7+3+5]

64. Find the magnetic field at a distance r from a long straight wire carrying a steady current I. Using the result find the field at the center of a regular n-sided polygon, carrying a steady current I. [10+5]

65. (a) Explain the effect of the following components on performance of amplifier:
(i) Biasing resistors
(ii) Coupling and bypass capacitors

(b) The ac equivalent circuit of a crystal has these values: $L = 1H$, $C = 0.01pF$, $R = 1k\Omega$ and $C_m = 20pF$. Calculate series resonant and parrallel resonant frequencies of the crystal.

(c) The total harmonic distortion of an amplifier is reduced from 15% to 3% when 4% negative feedback is used. Find
(i) the voltage gain without feedback
(ii) the voltage gain with feedback. [5+5+5]

POLITICAL SCIENCE

66. Organised party system both in developed and developing countries is undergoing a process of decline. Do you agree with this view? Give reasons for your answer.

67. Critically examine the concept of state sovereignty in the era of globalisation

68. Do you agree with the view that liberal democracy in North-East India is under turmoil? Give your reasons.

69. Define 'Political Culture'. Analyse the nature of political culture in India.

70. Do you agree with the view that pressure groups overcome the 'democratic deficit' in liberal democracy? Examine your argument by illustrating example from Indian democracy

SOCIOLOGY

71. What is Family? What are the different perspectives of family?

72. Analyse the development of caste and class politics in India and its equation with power in post colonial India.

73. What is social stratification? Compare and contrast the views of Marxists and functionalists on the issue of social stratification.

74. Do you think reservation really leads to empowerment? Give your answer with special reference to Woman Reservation Bill.

75. 'The history of all hitherto existing societies is the history of class struggle'. Comment.

ZOOLOGY

76. Define gene mutation. Discuss different types of mutation caused by various mutagens. Describe post mutation DNA repair mechanism.

77. What do you understand by organic evolution? Justify the concept of evolution with the help of embryological and biochemical evidences. Correlate the topic with Darwin's theory of natural selection.

78. Define ecosystem. Discuss the limiting factors of an ecosystem. Mention the fate of solar energy from its source to consumers in an ecosystem. What is the functional unit of an ecosystem?

79. What is the composition of blood? Enumerate the functions of blood. Give the detail account of different types of blood groups. Explain Rhesus factor.

80. What do you mean by economic zoology? Name the different species of silk moths and honey bees of India. Describe in brief the life history of any one of them. Give an account of the diseases of the insect and their remedies.